IN THE CLAIMS:

1. (Currently Amended) An improved initialization method for a communication system comprising the steps of:

estimating a timing offset utilizing non-data aided correlation with an entire received DMT frame, wherein the timing offset further comprises an integer timing offset and a fractional timing offset; and

estimating a channel impulse response utilizing at least one pilot tone, wherein the received DMT frame further comprises the at least one pilot tone.

2. (Original) The method of claim 1, wherein the steps of estimating a timing offset and estimating a channel impulse response are performed substantially simultaneously.

3. (Original) The method of claim 1, wherein the received DMT frame comprises a plurality of DMT frames.

4. (Original) The method of claim 1, wherein the at least one pilot tone further comprises a plurality of pilot tones.

5. (Original) The method of claim 1, wherein the step of estimating timing offset information further comprises the steps of:

transmitting a plurality of DMT frames of length N+LP, where N is equal to the number of samples comprising the DMT symbol and LP is equal to the number of samples comprising a cyclic prefix;

receiving the plurality of DMT frames at a receiver;

performing interpolation on the received DMT frames; and

estimating an integer timing offset and a fractional timing offset from the DMT frames utilizing non-data aided maximum likelihood correlation with a pre-stored frame of length N+LP.

6. (Original) The method of claim 5, further comprising the step of correcting for the integer timing offset in the time-domain.

7. (Original) The method of claim 5, further comprising the step of correcting for the fractional timing offset in the frequency-domain.

8. (Original) The method of claim 1, wherein the step of estimating the channel impulse response further comprises the steps of:

transmitting a plurality of DMT frames comprising a plurality of known pilot tones;

receiving the DMT frames coincident with modem synchronization; and

estimating the channel impulse response utilizing MMSE criterion through the pilot tones.

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9. (Previously Amended) The method of claim 8, further comprising synthesizing a frequency domain equalizer based on the estimation of the channel impulse response.

10. (Previously Amended) The method of claim 9, wherein the channel impulse response is padded with zeroes to accommodate for circular convolution prior to synthesizing the frequency domain equalizer.

11. (Original) The method of claim 8, wherein the plurality of pilot tones further comprises pilot tones modulated with a known symbol.

12. (Currently Amended) An improved method of estimating a timing offset comprising the steps of:

receiving an entire DMT frame; and

utilizing the entire received DMT frame to estimate the timing offset through <u>non-data aided</u> correlation.

13. (Original) The method of claim 12, wherein the received DMT frame comprises a plurality of DMT frames.

14. (Original) The method of claim 12, further comprising the steps of:

transmitting a plurality of DMT frames of length N+LP, where N is equal to the number of samples comprising the DMT symbol and LP is equal to the number of samples comprising a cyclic prefix;

receiving the plurality of DMT frames at a receiver;

performing interpolation on the received DMT frames; and

estimating an integer timing offset and a fractional timing offset from the DMT frames utilizing non-data aided maximum likelihood correlation with a frame of length N+LP.

15. (Original) The method of claim 14, further comprising correcting for the symbol timing offset in the time-domain responsive to the integer timing offset.

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16. (Original) The method of claim 14, further comprising correcting for the sample timing offset in the frequency-domain responsive to the fractional timing offset.

17. (Previously Amended) An improved method of estimating a channel impulse response comprising the steps of:

receiving a DMT frame during modem synchronization, the DMT frame further comprising at least one pilot tone;

utilizing the at least one pilot tone to estimate the channel impulse response.

18. (Original) The method of claim 17, wherein the received DMT frame comprises a plurality of DMT frames.

19. (Original) The method of claim 17, wherein the at least one pilot tone further comprises a plurality of pilot tones.

20. (Original) The method of claim 17, further comprises estimating the channel impulse response utilizing Minimum Mean Square Error criterion for the known pilot tones.

21. (Previously Amended) The method of claim 20, further comprising synthesizing a frequency domain equalizer based on the estimation of the channel impulse response.

22. (Previously Amended) The method of claim 21, wherein the channel impulse response is padded with zeroes to accommodate for circular convolution prior to synthesizing the frequency domain equalizer.

23. (Original) The method of claim 20, wherein the plurality of pilot tones further comprise pilot tones modulated with a known symbol.

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24. (Currently Amended) An improved initialization method for modem communication comprising the steps of:

transmitting a plurality of DMT frames of length N+LP, where N is equal to the number of samples comprising the DMT symbol and LP is equal to the number of samples comprising a cyclic prefix

transmitting a plurality of pilot tones within the plurality of DMT frames;

receiving the plurality of DMT frames at the receiver;

extracting timing offset information from the DMT frames through <u>non-data aided</u> correlation with a pre-stored DMT frame, wherein correlation is performed using the entire DMT frame of N+LP samples;

performing interpolation on the received DMT frames resulting in an integer timing offset and a fractional timing offset; and

estimating the channel impulse response from the plurality of pilot tones within the received DMT frames.

25. (Original) The method of claim 24, further comprising:

correcting for a symbol timing offset in the time-domain responsive to the integer timing offset; and

correcting for a sample timing offset in the frequency-domain responsive to the fractional timing offset.

26. (Previously Amended) The method of claim 24, further comprises synthesizing a frequency domain equalizer based on the estimation of the channel impulse response.

27. (Previously Amended) The method of claim 26, wherein the channel impulse response is padded with zeroes to accommodate for circular convolution prior to synthesizing the frequency domain equalizer.

28. (Original) The method of claim 24, wherein the plurality of pilot tones further comprise pilot tones modulated with a known symbol.

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29. (Currently Amended) An improved initialization method for modem communication comprising the steps of:

transmitting a plurality of DMT frames of length N+LP, where N is equal to the number of samples comprising the DMT symbol and LP is equal to the number of samples comprising a cyclic prefix

transmitting a plurality of known symbols over L known pilot tones within the plurality of DMT frames;

receiving the plurality of DMT frames at the receiver;

performing interpolation on the received DMT frames;

estimating an integer timing offset and a fractional timing offset from the DMT frames through <u>non-data aided</u> correlation with a pre-stored DMT frame, wherein correlation is performed using the entire DMT frame of N+LP samples;

correcting for a symbol timing offset in the time-domain responsive to the integer timing offset;

correcting for a sample timing offset in the frequency-domain responsive to the fractional timing offset;

estimating the channel impulse response utilizing the L pilot tones within the received DMT frames;

padding the channel impulse response with (N-L) zeroes; and

synthesizing a 1-tap frequency domain equalizer based on the channel impulse response.

30. (Currently Amended) An improved system for modem communication comprising:

a timing offset estimator adapted to estimate a timing offset utilizing an entire received DMT frame, wherein the timing offset further comprises an integer timing offset and a fractional timing offset; and

a channel impulse response estimator adapted to estimate a channel impulse utilizing at least one pilot tone, wherein the received DMT frame further comprises the at least one pilot tone.

31. (Original) The system of claim 30, wherein the timing offset estimator and the channel impulse response estimator are adapted to operate substantially simultaneously.

32. (Original) The system of claim 30, wherein the received DMT frame comprises a plurality of DMT frames.

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33. (Original) The system of claim 30, wherein the at least one pilot tone further comprises a plurality of pilot tones.

34. (Original) The system of claim 30, wherein the timing offset estimator further comprises:

a transmitter adapted to transmit a plurality of DMT frames of length N+LP, where N is equal to the number of samples comprising the DMT symbol and LP is equal to the number of samples comprising a cyclic prefix;

a receiver adapted to receive the plurality of DMT frames;

an interpolator adapted to perform interpolation on the received DMT frames; and

a correlator adapted to estimate an integer timing offset and a fractional timing offset from the DMT frames utilizing non-data aided maximum likelihood correlation with a pre-stored frame of length N+LP.

35. (Original) The system of claim 34, further comprising a symbol clock correction circuit adapted to correct a symbol timing offset in the time-domain responsive to the integer timing offset.

36. (Original) The system of claim 34, further comprising a rotor-delay correction circuit adapted to correct a sample timing offset in the frequency-domain responsive to the fractional timing offset.

37. (Original) The system of claim 30, wherein the channel impulse response estimator estimates the channel response utilizing a Minimum Mean Square Error criterion of the known pilot tones.

38. (Previously Amended) The system of claim 37, further comprising a synthesizer adapted to synthesize a frequency domain equalizer based on the estimation of the channel impulse response.

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39. (Previously Amended) The system of claim 38, wherein the channel impulse response is padded with zeroes to accommodate for circular convolution prior to synthesizing the frequency domain equalizer.

40. (Original) The method of claim 37, wherein the plurality of pilot tones further comprise pilot tones modulated with a known QAM symbol.

41. (Previously Amended) An improved system for estimating a timing offset utilizing <u>non-data aided</u> correlation with an entire received DMT frame.

42. (Original) The system of claim 41, wherein the received DMT frame comprises a plurality of DMT frames.

43. (Original) The system of claim 41, wherein the timing offset estimator further comprises:

a transmitter adapted to transmit a plurality of DMT frames of length N+LP, where N is equal to the number of samples comprising the DMT symbol and LP is equal to the number of samples comprising a cyclic prefix;

a receiver adapted to receive the plurality of DMT frames;

an interpolator adapted to perform interpolation on the received DMT frames; and

a correlator adapted to estimate an integer timing offset and a fractional timing offset from the DMT frames utilizing non-data aided maximum likelihood correlation with a pre-stored frame of length N+LP.

44. (Original) The system of claim 43, further comprising correcting a symbol clock correction circuit adapted to correct a symbol timing offset in the time-domain responsive to the integer timing offset.

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45. (Original) The system of claim 43, further comprising a rotor-delay correction circuit adapted to correct a sample timing offset in the frequency-domain responsive to the fractional timing offset.

46. (Original) An improved system for estimating a channel impulse response utilizing at least one pilot tone, wherein a received DMT frame further comprises the at least one pilot tone and the DMT frame is received during modem synchronization.

47. (Original) The system of claim 46, wherein the received DMT frame comprises a plurality of DMT frames.

48. (Original) The system of claim 46, wherein the at least one pilot tone further comprises a plurality of pilot tones.

49. (Original) The system of claim 46, wherein a channel impulse response estimator estimates the channel response utilizing a Minimum Mean Square Error criterion of the known pilot tones.

50. (Previously Amended) The system of claim 49, further comprising a synthesizer adapted to synthesize a frequency domain equalizer based on the estimation of the channel impulse response.

51. (Previously Amended) The system of claim 50, wherein the channel impulse response is padded with zeroes to accommodate for circular convolution prior to synthesizing the frequency domain equalizer.

52. (Original) The system of claim 46, wherein the plurality of pilot tones further comprise pilot tones modulated with a known symbol.

53. (Currently Amended) An improved system for modem communication comprising the steps of:

a transmitter adapted to transmit a plurality of DMT frames of length N+LP, where N is equal to the number of samples comprising the DMT symbol and LP is equal to the number of samples comprising a cyclic prefix

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the transmitter adapted to transmit a plurality of pilot tones within the plurality of DMT frames;

a receiver adapted to receive the plurality of DMT;

a timing offset estimator adapted to estimate a timing offset from the DMT frames through non-data aided correlation with a pre-stored DMT frame, wherein correlation is performed using the entire DMT frame of N+LP samples;

an interpolator adapted to interpolate the received DMT frames resulting in an integer timing offset and a fractional timing offset; and

a channel impulse estimator adapted to estimate the channel impulse response from the plurality of pilot tones within the received DMT frames.

54. (Original) The system of claim 53, further comprising:

a symbol clock correction circuit adapted to correct a symbol timing offset in the time-domain responsive to the integer timing offset; and

a rotor-delay correction circuit adapted to correct a sample timing offset in the frequency-domain responsive to the fractional timing offset.

55. (Previously Amended) The system of claim 53, further comprising a synthesizer adapted to synthesize a frequency domain equalizer based on the estimation of the channel impulse response.

56. (Previously Amended) The system of claim 55, wherein the channel impulse response is padded with zeroes to accommodate for circular convolution prior to synthesizing the frequency domain equalizer.

57. (Original) The system of claim 53, wherein the plurality of pilot tones further comprise pilot tones modulated with a known symbol.

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58. (Currently Amended) An improved system for modem communication comprising:

a transmitter adapted to transmit a plurality of DMT frames of length N+LP, where N is equal to the number of samples comprising the DMT symbol and LP is equal to the number of samples comprising a cyclic prefix

the transmitter transmitting a plurality of known symbols over L known pilot tones within the plurality of DMT frames;

a receiver adapted to receive the plurality of DMT frames;

an interpolator adapted to interpolate the received DMT frames;

a timing offset estimator adapted to estimate an integer timing offset and a fractional timing offset from the DMT frames through <u>non-data aided</u> correlation with a pre-stored DMT frame, wherein correlation is performed using the entire DMT frame of N+LP samples;

a symbol clock corrector circuit adapted to correct a symbol timing offset in the time-domain responsive to the integer timing offset;

a delay-rotor circuit adapted to correct a sample timing offset in the frequency-domain responsive to the fractional timing offset;

a channel impulse response estimator adapted to estimate the channel impulse response utilizing the L pilot tones within the received DMT frames;

a circular convolution circuit adapted to pad the channel impulse response with (N-L) zeroes; and

a synthesizer adapted to synthesize a frequency domain based on the channel impulse

response.

59. (New) The method of claim 1 further comprising performing interpolation on the received DMT frame.

60. (New) The method of claim 1, wherein the step of estimating the timing offset further comprises:

performing interpolation on the received DMT frame; and

estimating an integer timing offset and a fractional timing offset from the DMT frame utilizing non-data aided maximum likelihood correlation with a pre-stored frame.

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61. (New) The method of claim 60, further comprising the step of correcting for the integer timing offset in the time-domain.

62. (New) The method of claim 60, further comprising the step of correcting for the fractional timing offset in the frequency-domain.

63. (New) The system of claim 30, further comprising, an interpolator adapted to perform interpolation on the received DMT frame.

64. (New) The system of claim 30, further comprising:

an interpolator adapted to perform interpolation on the received DMT frame; and

a correlator adapted to estimate an integer timing offset and a fractional timing offset from the DMT frames utilizing non-data aided maximum likelihood correlation with a pre-stored frame.

65. (New) The system of claim 64, further comprising a symbol clock correction circuit adapted to correct a symbol timing offset in the time-domain responsive to the integer timing offset.

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66. (New) The system of claim 64, further comprising a rotor-delay correction circuit adapted to correct a sample timing offset in the frequency-domain responsive to the fractional timing offset.